



Research Article

Effect of *Gyrinops Versteegii*'s Aromatherapy on Work Endurance in First-Year Medical Students

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ABSTRACT

The first year of college is a difficult time for new students. New students are required to have good endurance because it is one of the important factors that must be possessed by individuals to adapt well. Agarwood is known for its fragrant aroma, so it is widely used in aromatherapy. Special compounds contained in agarwood essential oil have a relaxing effect that can reduce fatigue levels. This study aims to examine the effect of *Gyrinops versteegii* essential oil aromatherapy on the work endurance in first-year students at the Faculty of Medicine, University of Muhammadiyah Surabaya. An experimental crossover design involving 32 first-year students. Data was collected through Inhalation of *Gyrinops versteegii* essential oil vapor from a diffuser, vital sign measurement, and Kraepelin test results. The data obtained will be processed using SPSS version 27 for Windows. Wilcoxon test results showed a significant difference in work endurance ($p = 0.025$). Kendall's Tau-b correlation test revealed a non-significant and weak correlation between work endurance ($p = 0.071$; $r = 0.284$). In conclusion, aromatherapy with *Gyrinops versteegii* essential oil has an impact on work endurance, with a significant decrease in work endurance in first-year medical students.



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INTRODUCTION

Experts agree that the first year of college is a difficult time for freshmen. New students are required to be able to adapt and meet behavioral, cognitive, and affective demands that come from the lecture environment (Ramadhani & Rahmawati, 2021). Having good endurance is one of the important factors that must be possessed by individuals to adapt well (Puspitasari et al., 2024). By definition, endurance is the ability that a person has to deal with stressful, threatening, or unexpected situations, as well as to cope with any changes that may occur (Anjarani et al., 2022).

One factor that can decrease work endurance is muscle fatigue, which has been defined as the inability to maintain strength output, causing a decrease in performance (Supriatna, 2020). When the body works, there is a process of breaking down glycogen, which produces energy and lactic acid. When muscles contract, lactic acid accumulates, inhibits muscle function, and causes fatigue (Anggraeny et al., 2021). Inhaling aromatherapy can increase the alpha waves associated with relaxation, and can help overcome insomnia and maintain body balance, reducing stress, headaches, and muscle spasms (Anjarani et al., 2022). Previous research has provided an overview of the aromatherapy potential of agarwood oil in its use of relaxation therapy (Wangiyana, 2019).

Agarwood (*Gyrinops versteegii*) is one of the plants that can be found in several locations, such as Lombok, Sumbawa, and Sumba (Widyarini et al., 2015). Agarwood is known for its fragrant aroma, so it is widely used as aromatherapy (Herliani, 2018). The special compounds contained in Agarwood essential oil, in addition to having a relaxing effect, are also proven to have an antidepressant effect (Wangiyana, 2019). However, the potential

of the agarwood plant is still not fully utilized (Widyarini et al., 2015). Until now, based on the search results on Google Scholar in the last 10 years with the keyword “benefits of essential oil *Gyrinops versteegii*,” There are only about 36 articles. The small number of studies can be used as a factor that supports the less optimal use of agarwood plants with *Gyrinops versteegii*.

Based on some of the problems above, the researcher is interested in improving the effect of the aromatherapy of *Gyrinops versteegii* essential oil on work endurance in first-year medical students at, University of Muhammadiyah Surabaya. This research is expected to be one of the management tools in improving the work endurance in new medical students at, University of Muhammadiyah Surabaya.

METHODS

The Health Research Ethics Committee of the Faculty of Medicine, University of Muhammadiyah Surabaya approved this study (No. 076/KET/II.3/AU/F/2024). The research was held at the Laboratory of Anatomical Pathology and Histology, Faculty of Medicine, University of Muhammadiyah Surabaya. This study employed an experimental method using a crossover design to analyze the effect of *Gyrinops versteegii* aromatherapy essential oil on work endurance among first-year medical students at the University of Muhammadiyah Surabaya. Furthermore, the analysis of chemical compounds in the essential oil and verification of its authenticity was conducted using Gas Chromatography-Mass Spectrometry (GC-MS) (Nur Aidha et al., 2020). The GC-MS analysis of *Gyrinops versteegii* essential oil was carried out at the Testing Service Unit of the Faculty of Pharmacy, Universitas Airlangga. The process utilized the Agilent 6980N Network GC System with an autosampler, and detection was performed using an Agilent 5973 inert MSD equipped with J&W Scientific HP-5MS



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columns (0.25 mm × 30 mm × 0.25 μm). A 1 μL sample of the essential oil was injected with a split ratio of 1:100. The oven temperature was programmed to increase gradually from 50°C to 280°C.

The study population comprised all first-year medical students at the University of Muhammadiyah Surabaya. Samples were selected based on specific inclusion criteria: willingness to participate by signing informed consent, non-smokers, abstinent from alcohol consumption, willing to refrain from physical exercise and the consumption of spicy foods for three days before the study, in good general health, and committed to eating breakfast before each test session. The selected samples were randomly divided into two groups, namely Group A and Group B. Each group was placed in a separate room and received different treatments across two experimental periods. In the first experimental period, Group A inhaled diffuser vapor containing 100 mL of water and 5 drops of *Gyrinops versteegii* essential oil (Adiwibawa et al., 2020), while Group B inhaled diffuser vapor containing only 100 mL

of water. Following this, a washout period of three days was implemented to eliminate any residual effects of the initial treatment (Lim & In, 2021). After the washout period, in the second experimental period, the treatments were cross-administered to each group. The distance between the diffuser and the sample is 30 cm (Rahayu, 2021). During the inhalation process, all participants underwent the Kraepelin test.

Data analysis was conducted using bivariate methods. The Wilcoxon signed-rank test was applied to determine whether the administration of *Gyrinops versteegii* essential oil had a significant effect on work endurance, while the Kendall's Tau-b correlation test was used to assess the strength of the observed relationship. A Wilcoxon test result was considered statistically significant if $p < 0.05$ (Budiono & Prasetya, 2022). The strength of the correlation in the Kendall's Tau-b test was interpreted as follows: very weak (0.00–0.20), weak (0.21–0.40), moderate (0.41–0.70), strong (0.71–0.90), and perfect (0.91–1.00) (Tara et al., 2022).

Table 1. Age of Respondents Class of 2024 FK UM Surabaya

Characteristics	Frequency	Percentage
a. Age		
18	15	46.9%
19	12	37.5%
20	5	15.6%
b. Gender		
Female	32	100%



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Work Endurance Levels

Table 2. Levels of Work Endurance from the Placebo and Agarwood Groups

Work Endurance Level (Hanker)	Placebo Group		Agarwood Group	
	Frequency	Percentage	Frequency	Percentage
1 (Very weak)	6	18.8 %	11	34.4 %
2 (Weak)	10	31.3 %	12	37.5 %
3 (Medium)	14	43.8 %	8	25.0 %
4 (Good)	2	6.3 %	1	3.1 %
5 (Very Good)	-	-	-	-
Total	32	100 %	32	100 %

Table 3. GC-MS Essential Oil *Gyrinops versteegii*

No	Name of compounds	Percentage
1.	Aromadendrene	6.625%
2.	2-Methylhexadecane	2.425%
3.	n-Cetane	2.287%
4.	Isoaromadendrene epoxide	2.126%
5.	2.6.10.10-Tetramethylbicyclo [7.2.0] Undeca-1.6-Diene	1.995%
6.	2-Butanone	1.986%
7.	n-Pentadecane	1.844%
8.	Heptadecan	1.837%
9.	7-Isopropenyl-1.4-Dimethyl-1.2.3.3A.4.5.6.7-Octahydroazulene	1.794%
10.	N-Pentacosane	1.255%
11.	Delta-Guaiene	1.233%
12.	Isotetradecane	0.510%
13.	Palmatic Acid	0.325%
14.	3.5-Dimethyldodecane	0.322%
15.	(3R(3A. Alpha.4A. Alpha.5.Alpha.9A. Beta.))-3.5.8-Trimethyl-3A.4.4A.5.6.7.9.9A-Octahydrozuleno (6.5-B)Furan-2(3H)-One	0.266%
16.	6-methyl tridecane	0.217%
17.	n-Nonadecane	0.184%
18.	5-Methyltridecane	0.176%
19.	4-Methyltridecane	0.159%
20.	Methyl Cyclopentane	0.142%
21.	Dodecamethylcyclohexasiloxane	0.130%
22.	n-Tridecane	0.105%



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Based on Table 1, the total research sample was 32 females, classified as young adults. In Table 2, for the placebo group, the majority had medium (43.8%) and weak (31.3%) work endurance, only 6.3% reached the good level, and none were in the very good category. As for the Agarwood group, the majority have weak (37.5%) and very weak (34.4%) work endurance, only 3.1% have reached the good level, and none are in the very good category.

Results of Profiling Gas Chromatography-Mass Spectrometry of *Gyrinops versteegii*'s Essential Oil

The results of the GC-MS analysis using Agilent 6980N Network GC System series instruments show that there are several compounds contained in the *Gyrinops verteeegii* essential oil as follows:

Wilcoxon Test Data of Work Endurance

Test Wilcoxon is a type of non-parametric statistical method to determine the difference

between two groups of paired data on an ordinal scale or interval (Rahmad et al., 2024). It is said that there is a significant difference if the value of *Asymp. Sig* < 0.05, while if the value is *Asymp. Sig* > 0.05 means no significant difference (Budiono & Prasetya, 2022).

Based on Table 4, for work endurance of 32 research respondents, 14 respondents experienced a decrease in work endurance with an average decrease of 11.57 points, with a total decrease of 162 points; 12 respondents remained, and 6 respondents experienced an increase with an average increase of 8 points, with a total increase of 48 points.

Based on the results of the Wilcoxon test in Table 5, there was a significant difference in working endurance between the working endurance of first-year students who were given inhalation of the essential oil *Gyrinops versteegii* and first-year students who were only given water inhalation, with a significance level of 0.025.

Table 4. Description of Data Distribution Working Endurance

		Sum	Mean Rank	Sum Of Rank
Placebo Working Endurance	Decrease	14	11.57	162.00
	Increased	6	8.00	48.00
Agarwood Working Endurance	Ties	12		
	Total	32		

Table 5. Essential Oil *Gyrinops versteegii* Against Work Endurance

Working Endurance	Asymp. Sig. (2-tailed)	Information
Placebo Working Endurance	.025	There is a Significant Difference
Agarwood Working Endurance		



Kendall’s Tau-b Correlation Test Data of

Table 6. Correlation Test: Kendall's Tau-b On Work Endurance

			Placebo Working Endurance	Agarwood Working Endurance
Kendall's tau_b	Placebo Working Endurance	Correlation	1.000	.284
		Coefficient		
		Sig. (2-tailed)	.	.071
	Agarwood Working Endurance	N	32	32
		Correlation	.284	1.000
		Coefficient		
		Sig. (2-tailed)	.071	.
		N	32	32

Work Endurance

Correlation test Kendall’s Tau-b used to analyze the strength of relationships between variables that have an ordinal or cascading data scale, the data is said to be significant if *Asymp. Sig* less than 0.05 and is said to be insignificant if *Asymp. Sig* more than 0.05 (Damora et al., 2024). The strength of the relationship between variables can be seen in Correlation Coefficient, very weak if the value is 0.00-0.20, weak if the value is 0.21-0.40, strong if the value is 0.41-0.70, very strong if the value is 0.71-0.90, and perfect if the value is 0.91-1.00 (Tara et al., 2022).

Based on Table 6, there was a weak and insignificant relationship between *Gyrinops versteegii* essential oil and a decrease in work endurance in first-year students of FK UM Surabaya, where the correlation coefficient was 0.284 and insignificant with a significance level of 0.071.

DISCUSSION

Aromatherapy is used as an alternative method for relaxation and emotion management, with essential oils as the main component. Inhalation of diffuser vapors containing essential oils allows the molecules to interact with cilia in the nasal mucosa, which will stimulate the limbic system and hypothalamus, which can then produce sedative effects on the nervous system as well as the endocrine system. Not only that, aromatherapy inhalation triggers the release of neurotransmitters such as dopamine and serotonin that contribute to relaxing, stimulating, and mood-enhancing effects (Pratiwi & Subarnas, 2020). Based on results, Gas Chromatography Mass Spectroscopy (GC-MS). Three of 22 compounds are sesquiterpenes the compounds are Delta-guaiene, Isoaromadendrene epoxide, and Aromadendrene. Sesquiterpenes have a sedative effect (Widyaningrum et al., 2018).



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The sedative effect can provide relaxation, improve sleep cycles, relieve anxiety and tension (Deviatkina et al., 2022). Relaxation has positive benefits to help lower fatigue levels (Supriyanti & Kustriyani, 2024). Good fatigue management can contribute to increased work endurance and productivity (Gustara et al., 2023).

First-year students are prone to fatigue caused by the adaptation process and heavy tasks (Ramadhani & Rahmawati, 2021). Fatigue can reduce work endurance so that performance is not optimal (Supriatna, 2020). Moreover, In young adulthood, mental stress is also often experienced, the cause is difficulties in social interaction, prone to experiencing problems, receiving many demands from the environment (Nadya et al., 2023). Stress is believed to be the cause of fatigue disorders (Adamsson & Bernhardsson, 2018). Fatigue results in a person not being optimal at work, acting slowly, having difficulty thinking, having difficulty concentrating, and even tending to forgetfulness (Welong et al., 2020). This research was conducted to find alternative therapies that can improve mood and provide a relaxation effect, so that they can reduce fatigue levels and increase work endurance.

After carrying out all research procedures and statistical tests. The results of Wilcoxon's statistical test showed that there was an effect of giving essential oil *Gyrinops versteegii* on work endurance, which was dominated by a decrease in work endurance. This is inversely proportional to the research conducted by previous research, where the effect of giving agarwood with *Aetoxylon sympetalum* can increase work endurance (Primadina et al., 2025). Therefore, to find out whether the decrease is really influenced by the essential oil *Gyrinops versteegii* or if there are other factors, a Kendall's Tau-B correlation test was carried

out. Based on Kendall's Tau-b correlation test, it was found that there was a weak and insignificant correlation. From this test, it means that the decrease in work endurance in this study occurred due to other factors and not due to the content contained in the essential oil *Gyrinops versteegii*, because the correlation is insignificant and weak. It is also based on the results of the search for the benefits of the 22 compounds contained in the essential oil *Gyrinops versteegii*, none of which are beneficial in reducing work endurance.

Some factors that can affect work endurance that researchers cannot control include: First, scent plays a role in shaping interest, taste, memory, and identity. If a person smells a pleasant scent, it automatically evokes positive feelings. On the other hand, unpleasant scents can trigger negative feelings and can even lead to unpleasant feelings (Wahyuningtyas, 2015). Feelings of dislike can lead to difficulty concentrating (Qodriyah et al., 2023). Second, the onset of boredom and decreased concentration will lead to negligence in completing work (Sari et al., 2022). Third, heavy workloads and slow adaptation processes can lead to low work endurance (Shofwa et al., 2024). Fourth, disturbed sleep quality can cause a decrease in concentration that which can result in a decrease in performance while working (Putriani & Triyantor, 2024). Fifth, there is fatigue that reduces work endurance. Fatigue can be caused by various things such as environmental conditions, age, quantity of sleep, length of work, exercise habits, and nutritional status (Istiani et al., 2024).

The limitation of this study is the small number of respondents, as well as the overall female respondents. This occurs due to the imbalance between male and female respondents obtained in recruitment, so it is feared that gender bias will occur. Suggestions for further research



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can increase the number of samples so that the results obtained are more accurate and extensive, add new variables in the hope of obtaining new information, and strictly control other factors that can affect work endurance.

CONCLUSION

There was an effect of aromatherapy of *Gyrinops versteegii* essential oil on the work endurance of first-year students of the Faculty of Medicine, University of Muhammadiyah Surabaya, with the result in a significant decrease in work endurance. This may not be due to the content contained in *Gyrinops versteegii* essential oil, but due to likes and dislikes for the aroma of *Gyrinops versteegii* essential oil.

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